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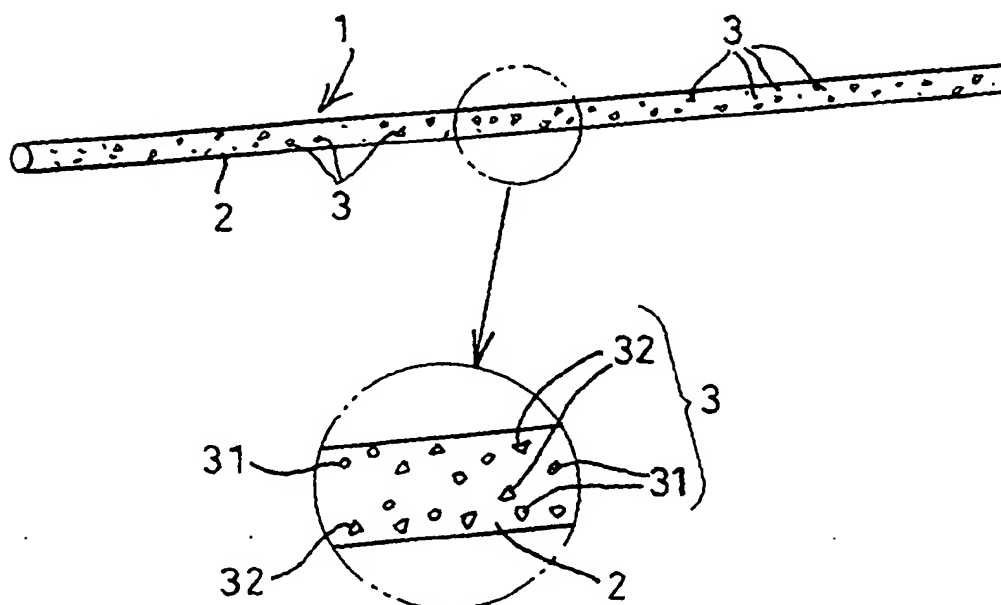
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(54) **Filamentary brush bristle material**

(57) Brush bristles include filaments of synthetic resin material (2) containing two or more types of abrasive particles (3) selected from among diamond powder,

stainless-steel powder, titanium powder, silicon carbide powder and aluminum oxide powder or silicon carbide or alumina abrasive grains.

**FIG.1**



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## Description

[0001] The present invention relates to a filamentary brush bristle material that can be used for abrading a work surface and grinding off burrs and the like. It particularly relates to a synthetic resin brush bristle material that contains two or more types of abrasive particles.

[0002] As is known, natural fibers, synthetic fibers and metal wire are the principle materials used in brushes for industrial applications, the material used depending on what the work material, the processing mode, and the purpose of use. There are also known brush bristle materials comprising various types of synthetic resin filaments that contain silicon carbide or aluminum oxide powder or abrasive grains.

[0003] However, with the prior art brush bristle materials such as those described above, the abrading of burrs cannot be ensured when there is scale on the work surface or when the work material is very hard. Even when the work can be abraded, it takes a long time and is highly inefficient.

[0004] An object of the present invention is therefore to provide a brush bristle material that can readily abrade any type of work surface and can be used with high precision for multiple purposes.

[0005] To achieve the above object, the present invention provides a filamentary brush bristle material comprised of synthetic resin material containing two or more types of abrasive particle selected from among diamond powder, stainless-steel powder, titanium powder, silicon carbide powder and aluminum oxide powder or silicon carbide or alumina abrasive grains.

[0006] The synthetic resin material can be comprised of a polyamide, a polyolefin such as polyethylene or polypropylene, a vinylidene halide such as polyvinylidene chloride or polyvinylidene fluoride, or a polyester such as polyethylene terephthalate or polybutylene terephthalate, and have a round or polygonal cross-section.

[0007] The abrasive particles may be contained in an amount that is from 1 to 90 percent by weight of the synthetic resin material, and preferably is from 10 to 50 percent by weight of the synthetic resin material. The abrasive particles can have a particle diameter of 0.1  $\mu\text{m}$  to 1 mm, and the filamentary diameter can be from 0.1 mm to 2 mm.

[0008] Using a brush bristle material thus comprised of synthetic resin material containing two or more types of abrasive particles not only provides a major improvement in abrading and grinding efficiency and burr removal efficiency resulting from the complementary effect of the characteristics possessed by the synthetic resin and the characteristics possessed by the plurality of powders or abrasive grains, but also makes it possible to reduce the time and labor required to process the work.

[0009] Further features of the invention, its nature and various advantages will be more apparent from the de-

tailed description of the invention made with reference to the accompanying drawings, in which:

Figure 1 shows a partially enlarged front view of an embodiment of the brush bristle material of the present invention,

Figure 2 shows a front view of a first example of the application of the brush bristle material of the invention,

Figure 3 shows a front view of a second example of the application of the brush bristle material of the invention,

Figure 4 shows a front view of a third example of the application of the brush bristle material of the invention,

Figure 5 shows a front view of a fourth example of the application of the brush bristle material of the invention,

Figure 6 shows a front view of a fifth example of the application of the brush bristle material of the invention, and

Figure 7 shows a front view of a sixth example of the application of the brush bristle material of the invention.

[0010] The brush bristle material 1 of the present invention is filamentary in shape and, as shown by Figure 1, comprises synthetic resin material 2 containing at least two types of abrasive particles 3. As the synthetic resin material 2, there can be used any material that is generally employed as brush bristle material. Preferred materials include a polyamide, a polyolefin such as polyethylene or polypropylene, a vinylidene halide such as polyvinylidene chloride or polyvinylidene fluoride, and a polyester such as polyethylene terephthalate or polybutylene terephthalate.

[0011] The two or more types of abrasive particles 3 contained in the synthetic resin material 2 to abrade or grind can be diamond powder, which is hard and has a high abrading and grinding functionality, stainless-steel powder, which has a relatively high abrading and grinding functionality, titanium powder, which has an abrading and grinding functionality and high heat-resistance effect, and silicon carbide powder or aluminum oxide powder, which are generally used. Silicon carbide or alumina abrasive grains can also be effectively used as abrasive particles.

[0012] The diameter of the abrasive particles 3 is preferably in the range of 0.1  $\mu\text{m}$  to 1 mm. When it is less than 0.1  $\mu\text{m}$ , the particles fail to function as the abrasive particles. When it exceeds 1 mm, it is difficult for the abrasive particles to be contained in the synthetic resin material 2.

[0013] The brush bristle material 1 shown in Figure 1 is comprised of synthetic resin material 2 containing a mixture of, by weight, 30 parts of diamond powder 31 and 70 parts of silicon carbon powder 32. The two powders account for 25% by weight of the synthetic resin

material 2. When a brush formed by bundling a plurality of filaments of the brush bristle material 1 is used for abrading and grinding work or for removing burrs, the functionality of each powder can be exhibited. The brush bristle material 1 of Figure 1 contains diamond powder 31, which has a powerful abrading functionality, and silicon carbon powder 32, in a ratio of 30 parts by weight of diamond powder 31 to 70 parts by weight of silicon carbon powder 32. As a result, the brush bristles have a higher abrading effect than brush bristles that use just silicon carbide powder.

[0014] The synthetic resin material contains 1 to 90 weight-percent of abrasive particles, and more preferably 10 to 50 weight-percent. If the content of the abrasive particles is less than 1 weight-percent, the abrasive qualities thereof will not be exhibited, while if the content goes above 90 weight-percent, it becomes difficult to form the filaments. The diameter of the filaments of the brush bristle material 1 is from 0.1 mm to 2 mm. Filaments having a smaller diameter will lack stiffness, making them unsuitable for use in a brush used for abrading. Filaments having a larger diameter will limit the industrial applicability of the brush.

[0015] There is no particular limitation on the cross-section of the synthetic resin material 2, which can be round, or in the shape of a regular or irregular polygon. With a round cross-section, the abrading of the work is made smoother by the end-face portions, owing to the peripheral curved shape thereof, while in the case of a polygonal cross-section, the periphery has a linear shape and the apical portion also has an abrading function, enabling stronger contact that improves the work process efficiency.

[0016] Figure 2 shows a first application example of the brush bristle material of the invention. This comprises a plurality of the brush bristle material 1 filaments containing a mixture of two or more types of the abrasive particles 3, aligned and bound by binding-wire 4 wound in a spiral around the circumference to form filamentary brush bristle material 11. With the inclusion of one, two or more types of abrasive powder in the binding-wire 4 of the brush bristle material 11, as in the synthetic resin material 2 of the brush bristle material 1, the binding-wire 4 can also be used to abrade the work. However, the binding-wire 4 does not have to include abrasive powder.

[0017] Figure 3 shows a second application example of the invention, in which a plurality of filaments of the brush bristle material 1 containing a mixture of two or more types of the abrasive particles 3 is aligned and bound by netting 5 to form filamentary brush bristle material 12. The netting 5 can also be formed of resin containing abrasive particles, or of material not containing abrasive particles.

[0018] Figure 4 shows a third application example of the invention, in which a plurality of filaments of the brush bristle material 1 containing a mixture of two or more types of the abrasive particles 3 is twisted into a

single strand of brush bristle material 13. Figure 5 shows a fourth application example of the invention in which the brush bristle material 1 containing two or more types of abrasive particles is formed as a cylindrical brush bristle material 14. In the first to third application examples, each of the filaments is coated with a liquid adhesive, and the filaments are then bundled together and the adhesive allowed to dry, forming bonding the filaments together to form brush bristles having good stiffness.

[0019] Figure 6 shows a fifth application example of the brush bristle material of this invention in which metal wire 6 is integrally inserted into brush bristle material 1 containing two or more types of abrasive particles to form brush bristle material 15. With such bristles, the work can be abraded and burrs removed by the ends constituted by abrasive particles, resin and metal wires, making it possible to configure the brush for the material and shape of the work concerned. With respect to the fifth application example, instead of the metal wire 6, there can be inserted synthetic resin or natural fiber filaments containing or not containing abrasive particles, or any other type of filamentary material used in brushes.

[0020] Figure 7 shows a sixth application example of the brush material of the invention, comprising the brush bristle material 1 containing two or more types of abrasive particles. In this example, a synthetic resin sphere 7 is affixed to one or both ends of each strand of the brush bristle material 1, forming brush bristle material 16. The sphere 7 on the ends provides a smoother contact with the work, and is therefore suitable for finish lapping. The sphere 7 can be affixed to the end of the brush bristles by heating the ends to soften the material 1 and then pressing the sphere 7 onto the end, or the material 1 and sphere 7 can be heated for contact bonding. The sphere 7 can include or not include abrasive particles.

[0021] A brush using the above-described brush bristle material can be fabricated by bundling a plurality of bristle filaments together, using a channel jig, or the bristles can be inserted directly into the brush base and bonded, to form a roll brush, coil brush, wheel brush, cup brush, a twist brush, and so forth. To abrade or grind a work surface or to remove burrs inside holes in the work, the ends of the bristles are pressed on the work and the brush rotated in one or both directions. This ensures that the work is properly abraded, ground or deburred. Moreover, since the bristle material contains two or more types of abrasive particles, the surface of the work can be processed using the right brush bristle material for the work material or structure concerned.

[0022] Brushes can be configured using the above brush bristle material containing two or more types of abrasive particles, and brush bristles of synthetic fiber containing or not containing abrasive grains or powder, brush bristles comprised of pig bristle, horsehair or other animal fibers, wire brush material comprised of stainless-steel, piano wire or copper wire or the like, or metal brush bristle materials comprising metal wire having a

surface plating or electro-deposition containing diamond powder, titanium powder, stainless-steel powder or other powder or abrasive particles. The brush materials used can be combined depending on the work material, the processing objective, the part being processed, and so forth.

[0023] While the invention has been described with reference to the embodiments shown in the drawings, the invention is not limited to the illustrated embodiments. Instead, other arrangements can be used to the extent that any such other arrangement does not depart from the defined scope of the invention.

[0024] To summarize, the present invention comprises a filamentary brush bristle material of synthetic resin material containing two or more types of abrasive particle selected from among diamond powder, stainless-steel powder, titanium powder, silicon carbide powder and aluminum oxide powder, or silicon carbide or alumina abrasive grains. The mutually complementary effect of the characteristics possessed by the synthetic resin and the characteristics possessed by the plurality of powders or abrasive grains provides a major improvement in abrading and grinding efficiency and burr removal efficiency, and also makes it possible to reduce the time and labor required to do the work. Moreover, brushes made by combining different types of bristles have the same functions, so brushes can be made to order in accordance with the work material concerned, the aim of the processing, the part to be processed, and so forth, further enhancing the practical value of the invention.

by weight of the synthetic resin material (2).

5. The filamentary brush bristle material (1) according to claim 1, wherein the abrasive particles (3) have a particle diameter of from 0.1  $\mu$ m to 1 mm.
6. The filamentary brush bristle material (1) according to claim 1, wherein a filamentary diameter is from 0.1 mm to 2 mm.

#### Claims

1. A filamentary brush bristle material (1) comprised of synthetic resin material (2) containing two or more types of abrasive particles (3) selected from among diamond powder, stainless-steel powder, titanium powder, silicon carbide powder and aluminum oxide powder or silicon carbide or alumina abrasive grains.
2. The filamentary brush bristle material (1) according to claim 1, wherein the synthetic resin material (2) comprises a polyamide, a polyolefin such as polyethylene or polypropylene, a vinylidene halide such as polyvinylidene chloride or polyvinylidene fluoride, or a polyester such as polyethylene terephthalate or polybutylene terephthalate.
3. The filamentary brush bristle material (1) according to claim 1 or 2, wherein the material has a round or polygonal cross-section.
4. The filamentary brush bristle material (1) according to claim 1, wherein the abrasive particles (3) are contained in an amount that is from 1 to 90 percent

FIG.1

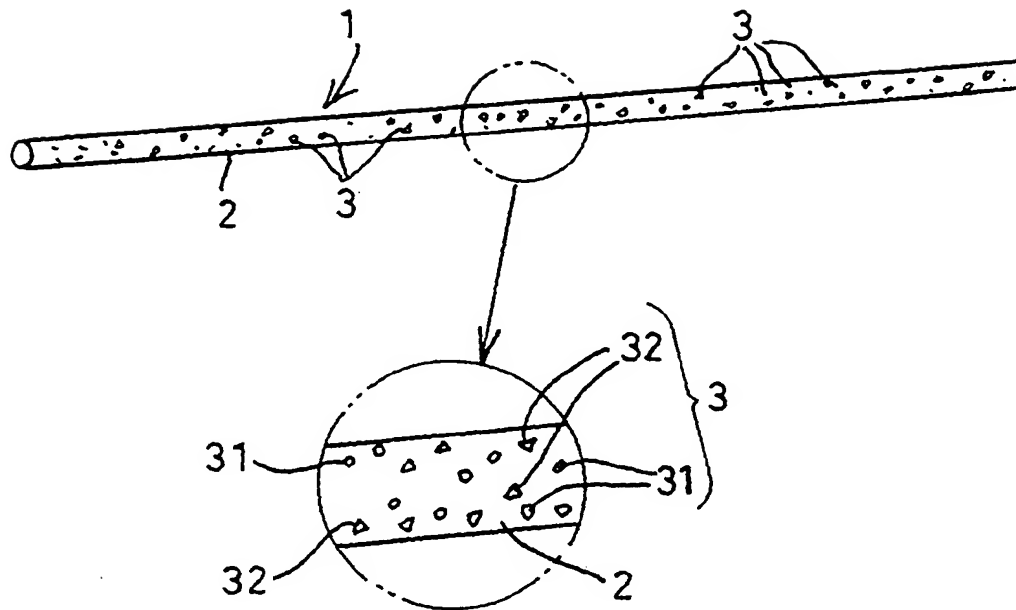


FIG.2

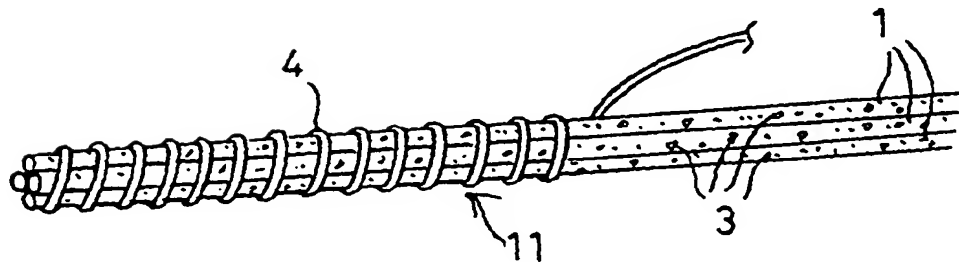


FIG.3

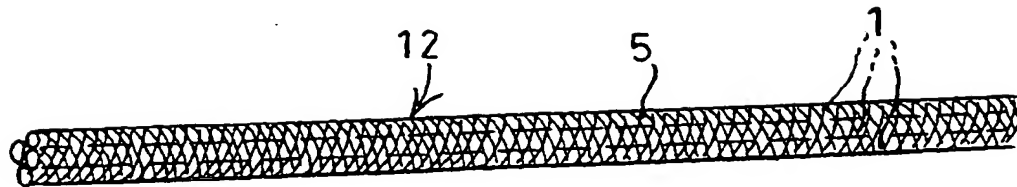


FIG.4

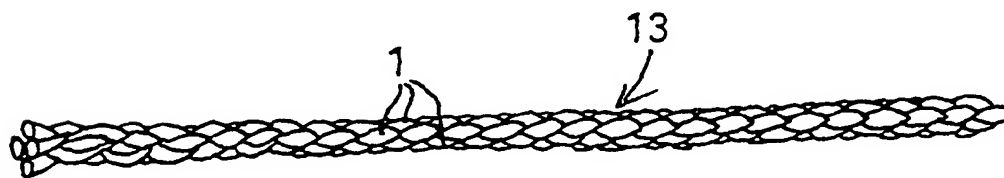


FIG.5

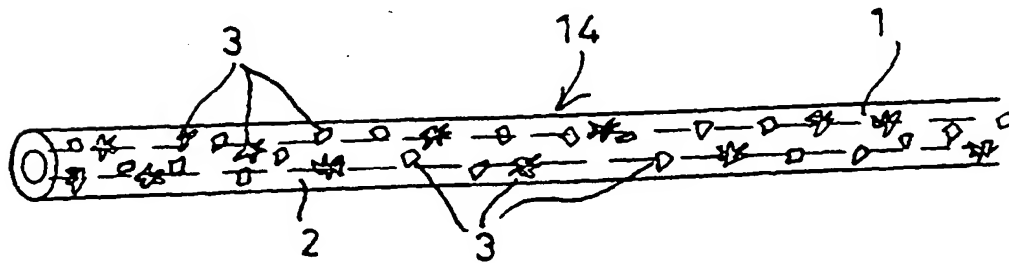


FIG.6

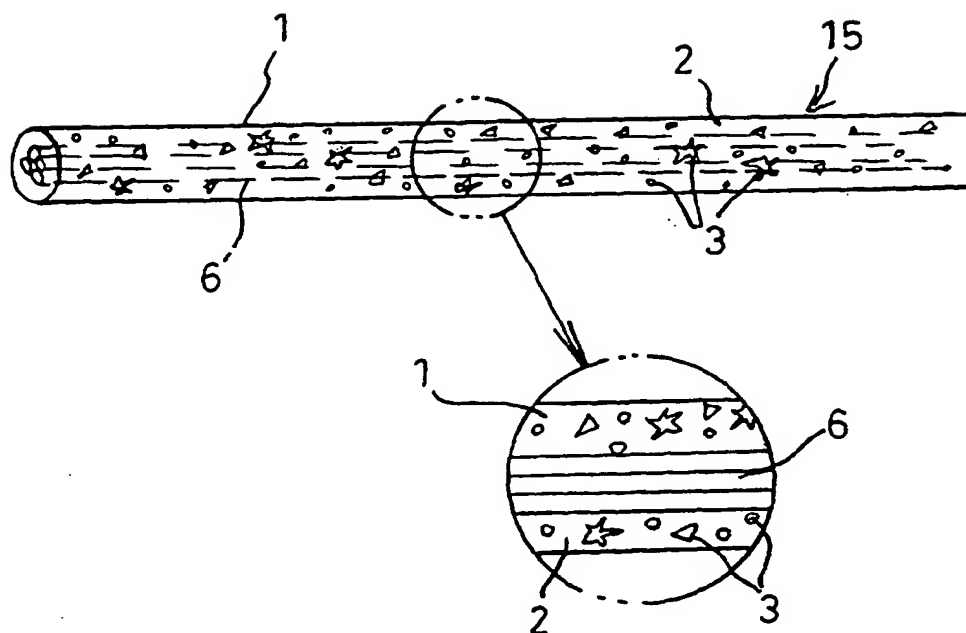
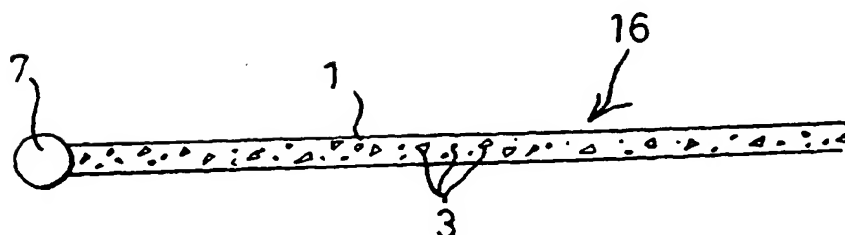


FIG.7





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## EUROPEAN SEARCH REPORT

Application Number  
EP 01 31 0569

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	WO 00 49208 A (E.I. DU PONT DE NEMOURS AND COMPANY) 24 August 2000 (2000-08-24) * page 3, line 1 - line 11; claims *	1-6	D01F1/10 D01F6/04 D01F6/06 D01F6/10 D01F6/12 D01F6/60 D01F6/62 A46D1/00
X	EP 0 282 243 A (KUREHA CHEMICAL IND CO LTD) 14 September 1988 (1988-09-14) * page 4, column 5, line 7 - line 27; claims *	1-6	
X	DATABASE WPI Section Ch, Week 199522 Derwent Publications Ltd., London, GB; Class A23, AN 1995-167856 XP002194537 & JP 07 090719 A (ASAHI KASEI KOGYO KK), 4 April 1995 (1995-04-04) * abstract *	1-6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			D01F A46D
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>27 March 2002</b>	Examiner <b>Tarrida Torrell, J</b>
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ON EUROPEAN PATENT APPLICATION NO.**

EP 01 31 0569

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27-03-2002

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0049208      A	24-08-2000	US      6190769 B1	20-02-2001
		CN      1340112 T	13-03-2002
		EP      1165866 A1	02-01-2002
		WO      0049208 A1	24-08-2000
		US      6249928 B1	26-06-2001
EP 0282243      A	14-09-1988	JP      2592627 B2	19-03-1997
		JP      64002873 A	06-01-1989
		DE      3871564 D1	09-07-1992
		DE      3871564 T2	21-01-1993
		EP      0282243 A2	14-09-1988
		ES      2037212 T3	16-06-1993
		KR      9103066 B1	17-05-1991
		US      5288554 A	22-02-1994
JP 7090719      A	04-04-1995	US      5238739 A	24-08-1993
		JP      3194269 B2	30-07-2001

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